<div align="center">**Representative Task # 1**</div>

**Precision Orbit Determination for Altimetry and Other Satellites (based on 1.4)**

**For the purposes of costing, assume that this Representative Task runs for Years 1 thru 4 of the contract.**

Background:

Satellites that carry a radar or a laser altimeter have stringent requirements to determine the orbit as precisely as possible. The requirement for the Jason series of missions (Jason-1, Jason-2, and the future Jason-3) is 1 cm overall radial orbit error. Over the 14 years of the TOPEX/Poseidon mission, the orbits were determined to a precision of 1.5 to 2.0 cm. A number of factors come into play to determine the ease with which this goal can be met: (1) the fidelity of the force models; (2) the quality and distribution of the tracking data; (3) the stability of the reference frame; (4) The reliability and accuracy of models and strategies for correcting the data for troposphere or ionosphere refraction; (5) the accuracy of data-specific corrections (e.g. phase-windup and antenna phase maps for GPS and GPS-user satellites). In the absence of continuous tracking, altimeter crossovers can serve as a valuable independent data type. In addition, the altimeter crossovers can serve to validate orbit performance and orbit improvements. The ability to compute reduced-dynamic and dynamic orbits with different data types, SLR, DORIS, GPS, and inter-compare the resultant orbits, is an essential tool to meet the once cm goal of precise orbit determination. With the Jason-1, Jason-2, Jason-3 and GFO-2 type of mission, there is a strong emphasis on operational oceanography and the rapid delivery of orbit and altimeter products. Strategies need to be developed to deliver medium precision orbits with a suitable accuracy and latency.

The Earth's gravitational field is of paramount importance among the force models, the gravity field research at GSFC can be divided into two areas: (1) improvement of the model for the static gravity field and associated geoid, and (2) measurement of the time variations of the gravity field due to both tidal forces as well as variations caused by non-tidal mass redistribution in the atmosphere, hydrosphere, and solid Earth. The latest static geopotential model is officially the Earth Gravitational Model EGM2008. It has been publicly released by the National Geospatial-Intelligence Agency EGM Development Team. This gravitational model is complete to spherical harmonic degree and order 2159, and contains additional coefficients extending to degree 2190 and order 2159.

Technical Requirements

The contractor shall:

1. Process geodetic tracking data to user altimeter satellites (TOPEX, GFO, Jason-1, Jason-2, ICESAT, DESDYN1), using the best possible parameterization, measurement

and force modeling.
This includes the latest time-varying gravitational models as determined independently from missions such as GRACE and CHAMP, as well as the latest static models and associated geoids, such as EGM2008.

2. Process SLR, DORIS & GPS data to TOPEX/Poseidon, Jason-1 and Jason-2 to continue the process of orbit refinement, and to deliver suitable products to NASA.

3. Support the Precise Orbit Determination teams (POD teams) for Jason-1 and Jason-2 and validate and inter-compare orbits with external analysis centers, compare analysis strategies with other POD analysis centers.

4. Implement and test new realizations of the terrestrial reference frame, and new refinements to measurement and force modeling, and reprocess as needed the tracking data to the historical altimeter satellites (GEOSAT, GFO, T/P, Jason-1, Jason-2).

5. Provide summaries of mission tracking for meetings of the International Laser Ranging Service (ILRS), and International DORIS Service (IDS). Assume that the meeting takes place in Toulouse, France.

6. Re-compute coordinates of geodetic tracking stations using altimeter satellite data, and tracking data to other satellites, if analysis shows these coordinates produce high residuals or anomalous results. Adjust macro-model parameters, or satellite attitude parameters as needed and dictated by the data and the processing requirements.